

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE - SEMESTER-VIII • EXAMINATION – SUMMER 2014**

**Subject Code: 182105****Date: 27-05-2014****Subject Name: Modern Techniques for Material Characterization****Time: 10:30 am TO 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) List the methods of thermal analysis. Explain in detail TGA. **07**  
(b) Discuss image analysis technique in terms of components of image analyzer, procedure and applications of image analysis. **07**
- Q.2** (a) What is color metallography? With proper examples explain application of color metallography. **07**  
(b) With a schematic compare optical microscope, SEM and TEM. What are the advantages of SEM over optical microscope? **07**
- OR**
- (b) Why material characterization is important? How will you classify the techniques for material characterization? **07**
- Q.3** (a) Write note on sample preparation for SEM. **07**  
(b) How TEM differs from SEM? List the components of TEM and explain their functions. **07**
- OR**
- Q.3** (a) With a schematic explain electron-solid interactions when electron beam strikes a sample. **07**  
(b) What is Atomic Absorption Spectroscopy (AAS)? Discuss briefly. **07**
- Q.4** (a) What are EDS and WDS? Explain with reference to material characterization. **07**  
(b) What is X-ray diffraction? Derive Bragg's law. **07**
- OR**
- Q.4** (a) Explain the application of XPS (ESCA) for material characterization. **07**  
**Q.4** (b) X-ray with wavelength of  $0.58 \text{ \AA}$  are used for calculating  $d_{200}$  in nickel. The reflection angle  $\theta$  is  $9.5^\circ$ . What is the size of the unit cell? **07**
- Q.5** (a) Write a short note on NMR technique. **07**  
(b) Discuss Differential Thermal Analysis technique. **07**
- OR**
- Q.5** (a) What is Auger Electron Spectroscopy? Explain briefly. **07**  
(b) Explain Electron Probe Micro Analysis (EPMA). **07**

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